



U.S. Department of Energy
Office of Inspector General
Office of Audits and Inspections

Audit Report

The Joint Actinide Shock Physics
Experimental Research Facility at
the Nevada National Security Site

OAS-L-12-05

April 2012



Department of Energy
Washington, DC 20585

April 23, 2012

MEMORANDUM FOR THE MANAGER, NEVADA SITE OFFICE

A handwritten signature in blue ink, appearing to read "David Sedillo".

FROM: David Sedillo, Director
Western Audits Division
Office of Inspector General

SUBJECT: INFORMATION: Audit Report on "The Joint Actinide Shock Physics
Experimental Research Facility at the Nevada National Security Site"

BACKGROUND

The Department of Energy, National Nuclear Security Administration's, Joint Actinide Shock Physics Experimental Research (JASPER) facility plays an integral role in the certification of the Nation's nuclear weapons stockpile by providing a method to generate and measure data pertaining to the properties of materials at high shock pressures, temperatures and strain rates through utilization of a two-stage gas gun. JASPER, located at the Nevada National Security Site, is a multi-organizational research facility that hosts personnel from Los Alamos National Laboratory (Los Alamos), Sandia National Laboratories (Sandia), and Lawrence Livermore National Laboratory (Livermore). The Nevada Site Office (Site Office) has Federal oversight and control of JASPER while National Security Technologies, LLC (NSTec), maintains the facility structures, systems and components. Livermore, a primary user of the facility, was responsible for specifying experiment parameters and executing experiments to meet programmatic milestones.

JASPER was constructed in 1999 and operated as a radiological facility until 2007, when NNSA categorized it as a hazard category 3 nuclear facility. Designation as a hazard category 3 nuclear facility did not affect the operations at JASPER; however, it increased the risk categorization of the facility and required the development of new safety and operational procedures. In February 2009, JASPER discontinued operations and all JASPER experiments with Special Nuclear Materials (SNM) ceased when an abnormal amount of contamination was identified as a result of an alpha plutonium experiment. Due to the significance of JASPER data to the nuclear weapons complex, we initiated this audit to determine whether NNSA was on track to return the JASPER facility to full operational status within cost and scheduled milestones and if the delay impacted NNSA's mission.

CONCLUSIONS AND OBSERVATIONS

NNSA returned the JASPER facility to full operational status within the budgeted cost and scheduled milestones as delineated in the Project Execution Plan, the governing document for the

execution of JASPER Return to Program (JRTP) Project. The Livermore and NSTec JASPER operations team received authorization from the Site Office on August 25, 2011, to restart JASPER operations. Thereafter, the facility successfully executed a test, involving SNM, in September 2011. As of September 2011, the JRTP Project was completed at a cost of \$18.9 million, approximately \$539,000 under the total budgeted baseline cost approved by NNSA.

Both NNSA and laboratory officials noted that timely restart was an important milestone as test results from JASPER provide information critical to stockpile certification. These officials noted that the impact of not conducting experiments at the JASPER facility since February 2009 resulted in Livermore and Los Alamos not having experimental data both planned to use to support the stockpile stewardship program and certification of the U.S. nuclear stockpile. Los Alamos indicated that it had delayed stewardship out-year goals and objectives because data from JASPER was unavailable. Finally, Livermore was not able to provide key data from JASPER experiments to meet NNSA Defense Program milestones, such as modeling. In lieu of not having data from JASPER during its shutdown, NNSA and laboratory officials stated that meaningful and complementary data from other experiments had been obtained to support NNSA's milestones and the stockpile stewardship program. For example, Los Alamos rescopeed projects at Sandia's Z machine to obtain complementary data to support the stockpile stewardship program. Laboratory officials explained that while data obtained from Sandia's Z machine was complementary, it did not provide plutonium data at the pressure and temperature rates provided by JASPER.

Although NNSA restored JASPER to full operational status within the planned cost and schedule and mitigated the adverse impacts of JASPER's shutdown, we identified several issues that could affect future operation of the facility. Specifically, we identified problems related to the risk of future contamination and re-categorization of JASPER as a radiological facility rather than its current categorization as a hazard category 3 nuclear facility.

Plutonium Target Material

Livermore did not have policies and procedures in place to ensure that deteriorated plutonium targets were not used in JASPER experiments. We noted that an abnormal amount of contamination was released during a 2009 experiment at JASPER (using such targets) that led to discontinued operations because the alpha phase plutonium¹ target had advanced surface deterioration. According to a Livermore official, oxidation, staging duration and atmospheric conditions caused deterioration of the target used in the JASPER experiment. Livermore plans to analyze factors affecting the deterioration of targets and to evaluate methods for assessing the condition of targets prior to use in experiments. Additionally, Livermore officials told us that they will establish new controls over the use of targets after they have established a shelf life/expiration date for targets.

Until Livermore establishes controls such as the shelf life/expiration date of alpha phase plutonium targets, operational controls will be essential to preventing future contamination

¹Plutonium is a metal that has different crystalline phases that include delta and alpha phases. Each phase has a different density and volume, and has its own characteristics (e.g., chemical, physical).

resulting from the use of deteriorated targets. Establishment of shelf life/expiration dates for alpha material targets are especially important since Livermore officials told us that they plan several more experiments using such targets at JASPER.

JASPER Facility Categorization

The Site Office is reconsidering the facility designation for JASPER, an action that could lead to reduced costs by allowing procurement of commercial grade hardware for JASPER and by lessening operational requirements based on re-defined safety basis requirements. In 2011, NNSA announced that it was rescinding its 2007 decision that the JASPER facility should be categorized as a hazard category 3 nuclear facility. The decision provided the Site Office with the opportunity to re-evaluate the JASPER facility's categorization and to reduce its operational costs, but did not change its hazard category 3 nuclear facility designation. According to Livermore and Site Office officials, categorization of JASPER from a hazard category 3 nuclear facility to a radiological facility would provide cost savings associated with quality assurance and safety basis requirements, and thereby improve their ability to execute more experiments. NNSA's decision was based on an analysis presented in the *JASPER Hazard Categorization White Paper*, a May 2011 report that concluded the final categorization of the facility should be radiological.

NNSA recently issued supplemental guidance to Departmental Standards in November 2011 that increased the amount of plutonium that can be stored and maintained at a facility, guidance that could impact the final facility categorization. The amount of plutonium staged and maintained for future experiments to be conducted at the JASPER facility is expected to be within the limits allowed for a radiological facility. NSTec, however, is currently analyzing the JASPER facility's categorization to determine final impacts.

SUGGESTED ACTIONS

Livermore was initiating steps and procedures to address the use of alpha phase plutonium targets; therefore, we are making no formal recommendations. However, given that the only abnormal contamination incident experienced at the JASPER facility occurred with an alpha phase plutonium target, we suggest that prior to the execution of an experiment using alpha phase plutonium target material, the Nevada Site Office Manager coordinate with Livermore to:

1. Establish shelf life/expiration dates for alpha phase plutonium target material;
2. Establish and document policies and procedures to ensure degraded targets are not used; and,
3. Evaluate the condition of the target material for any potential degradation.

We further suggest that the Nevada Site Office Manager:

4. Review the facility categorization analysis, currently being performed by NSTec, when it is completed and determine whether the status of the JASPER facility should be modified based on new inventory values identified in the updated NNSA guidance.

Because no recommendations are being made in this report, a formal response is not required. We appreciated the cooperation of your staff and laboratory officials that provided information and assistance during the audit.

Attachment

cc: Deputy Secretary
Associate Deputy Secretary
Administrator, National Nuclear Security Administration
Chief of Staff

OBJECTIVE, SCOPE AND METHODOLOGY

OBJECTIVE

The objective of this audit was to determine whether the National Nuclear Security Administration (NNSA) was on track to return the Joint Actinide Shock Physics Experimental Research (JASPER) facility to full operational status within cost and scheduled milestones and if the delay impacted NNSA's mission.

SCOPE

The audit was performed between May 2011 and March 2012. Our review was conducted at NNSA Headquarters, in Washington, DC; the Nevada Site Office, in North Las Vegas, Nevada; and, the Nevada National Security Site (NNSS), in Mercury, Nevada.

METHODOLOGY

To accomplish the audit objective, we:

- Toured the JASPER facility at NNSS;
- Interviewed Federal and contractor personnel at NNSA Headquarters, the Nevada Site Office, Lawrence Livermore National Laboratory, Los Alamos National Laboratory, National Security Technologies, LLC, and NNSS;
- Reviewed Department of Energy guidance, and Federal regulations, policies and procedures pertinent to the return of the JASPER facility to full operational status as a hazard category 3 nuclear facility; and,
- Reviewed Investigative Reports, Project Execution Plans, Operational Readiness Report, and other documents deemed pertinent to the subject audit.

We conducted this performance audit in accordance with generally accepted Government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our conclusions based on our audit objective. The audit included tests of controls and compliance with laws and regulations to the extent necessary to satisfy the audit objectives. In particular, we assessed the implementation of the *GPR Modernization Act of 2010* and found that the Department had established performance measures related to returning the JASPER facility to full operational status as a hazard category 3 nuclear facility. Because our review was limited, it would not necessarily have disclosed all internal control deficiencies that may have existed at the time of our audit. We did not rely on computer-processed data to satisfy our audit objective.

An exit conference was held with Departmental and laboratory officials on March 28, 2012.

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